ALLEN-BRADLEY

Absolute Encoder Module Cat. No. 1771-DE

Documentation Update

How to Use this Document

Use this documentation update with the Absolute Encoder Module User's Manual, publication 1771-6.5.32, January, 1986. This document revises the manual. Keep this update with your manual.

Use this documentation update instead of the Absolute Encoder Module Documentation Update 1, publication 1771-6.5.32-DU1, April, 1986. This document replaces the Documentation Update 1.

Updated Information

Add the following updated information to Chapter 2 in the Compatible Encoders section on page 2-2:

Compatible Encoder Output Drivers

There are three types of compatible encoder output drivers:

- standard TTL or LSTTL gates (7400, 74LS04)
- open collector (7406, 74LS38)
- differential line driver (DM8830, 75ALS192)

These encoders do not cause overcurrent through the optocoupler. When an input is high, the photodiode receives current through the on board pull-up resistor. When an input is low, the current flowing through the on board pull-up resistor is shunted away from the photodiode and pulled to ground.

The following sections remain unchanged from the first Documentation Update 1.

New Write-data Throughput Time

Refer to the module specifications on page 2-6. The new write-data throughput time (worst case) is 4.7 ms.

The new write-data throughput time is the time between the end of a block-transfer-write operation and the module update of its outputs. The module's response time can vary, depending on the number of outputs it controls, the type of absolute encoder you use, and if you have an offset value. Use the following table to determine the module's response time in milliseconds for your application.

Type of Encoder (with or without offset)	Number of Outputs			
	2	4	6	8
BCD without offset	1.2	1.8	2.5	3.1
BCD with offset	2.0	2.9	3.8	4.7
Gray code or binary without offset	1.3	2.0	2.6	3.3
Gray code or binary with offset	1.9	2.6	3.4	4.1

Electrostatic Discharge

Electrostatic discharge can damage integrated circuits or semiconductors in this module if you touch backplane connector pins. It can also damage the module when you set configuration plugs or switches inside the module. Avoid electrostatic discharge by observing the following precautions:

- touch a grounded object to discharge yourself before handling the module
- do not touch the backplane connector or connector pins
- when you configure and replace internal components, do not touch other circuit components inside the module. If available, use a static-safe work station
- when not in use, keep the module in its static-shield bag

ATTENTION: Electrostatic discharge can degrade performance or damage the module. Handle as stated above.

Response to External Fault

Add the following paragraphs to Chapter 3, immediately before the section on Keying (page 3-4):

Except for downloading programs or commands and reporting status, the module operates independent of the host processor. In the event of a processor or I/O communications fault, the module either continues operation or its outputs turn off, depending on how you set the last state switch of the chassis in which you place the module.

If you set the last state switch to turn outputs off, the module's outputs are turned off.

If you set the last state switch to hold outputs in last state, the module continues operating.

Removing Power Before Installing or Removing the Module

Replace the first warning on page 3-11 with the following:

ATTENTION: Remove power from the 1771 I/O chassis backplane and wiring arm before installing or removing the module.

- Failure to remove power from the backplane or wiring arm could cause module damage, degradation of performance, or injury
- Failure to remove power from the backplane could cause injury and/ or equipment damage due to possible unexpected operation

Offset Feature

Offset is a new feature of the Absolute Encoder Module (cat. no. 1771-DE, revision B). Revision A modules do not have this feature.

Offset is the difference between the 0 position of the absolute encoder and the 0 position of the machine shaft to which the encoder is connected. You can program this value to compensate for such factors as machine wear or improper mechanical setup. You do not have to disconnect your equipment to realign the 0 position of the machine shaft with the 0 position of the absolute encoder.

Determining the Offset Value

You can find the offset value using either of two equations, depending on whether you use the 0 machine position or the 0 encoder position as your reference.

To calculate an offset value from a 0 encoder position, use this equation:

$$N - M = S$$

where N = number of encoder positions, M = machine position at encoder 0, and S = offset.

To calculate an offset value form a 0 machine position, use this equation:

$$E - N = S$$

where E = encoder position at machine 0, N = number of encoder positions, and S = offset.

Here is an example of how to find the offset value with reference to 0 encoder position and 0 machine position. Assume the following:

- you have a 0 to 4095-position encoder (4096 positions)
- the machine shaft is at position 512 when the machine is at position 0
- the encoder is at position 3584 when the machine is at position 0

In this example, the 0 machine position is ‘‘ahead” of the 0 encoder position. Depending on which equation you use (your reference point), the offset value is either positive or negative.

Offset Value from 0 Encoder Position and From 0 Machine Position

The equation (from 0 encoder position) is:

4096 – 512 = 3584

The offset is +3584.

The equation (from 0 machine position) is:

3584 – 4096 = 512

The offset is –512.

You get the same result from programming either +3584 or –512.

Offset Words

Once you determine the offset value, you need to program two write-block-transfer words. These are the last two words of the write-data block that you send to the absolute encoder module. You program them in BCD, as you do the preset values.

Format of Offset Words

The first offset word contains the value of the offset. Bit 17 of this word is the sign bit. It indicates whether the offset is negative or positive. Set bit 17 if the offset is negative; reset it if the offset is positive.

The second offset word is the number of positions of the encoder. If you are using a 0 to 4095-position encoder, your second offset word is 4096.

Block-transfer-write Data with Offset

The number of words you send to the module depends on the number of outputs the module controls. The offset feature adds two words to the total number of words you send to the module:

If the module controls:	You send:
2 outputs	7 words
4 outputs	12 words
6 outputs	17 words
8 outputs	22 words

If the module is controlling eight outputs, your block-transfer-write data now looks like this:

Format of Block-transfer-write Data with Offset

Block-transfer-read Data with Offset

The upper byte of word 1 indicates the status of the eight outputs controlled by the module. The module sets each bit when the corresponding output is turned on.

The lower byte of word 1 (by bit) is:

- bit 7 is the loss-of-input-power bit. It is set when input power is lost; it is reset when power is restored **and** bit 6 is reset.
- bit 6 is the write-data-valid bit. It is set at power-up and when the processor changes from program mode to run mode; it is reset when the module receives valid data in a block-transfer-write operation.
- bit 5 is the non-BCD offset flag. See the description of bit 0 (below) to identify which offset word is in error.
- bit 4 is the non-BCD preset flag. It is set when a preset word is in non-BCD format.
- bits 3 thru 0 are a binary or hexadecimal code that indicates which preset word is not in BCD format. Refer to Appendix D of the User's Manual for the value of these bits.
- bit 0 identifies which offset word is in non-BCD format when bit 5 is also set
  - if bit 0 is set, the word containing the number of encoder positions is in error
  - if bit 0 is reset, the word containing the offset value is in error

  The module identifies each non-BCD word in the order it finds them (one at a time). Once you correct the format of one word, the module continues to identify other non-BCD words.

Word 2 indicated the current position of the encoder, with the offset value, in BCD.

Format of Block-transfer-read with Offset

Programming Considerations with Offset

The default block lengths (00) for block-transfer instructions are 20 block-transfer-write words and two block-transfer-read words. These are the block lengths that transfer to and from the absolute encoder regardless of whether you use the offset feature.

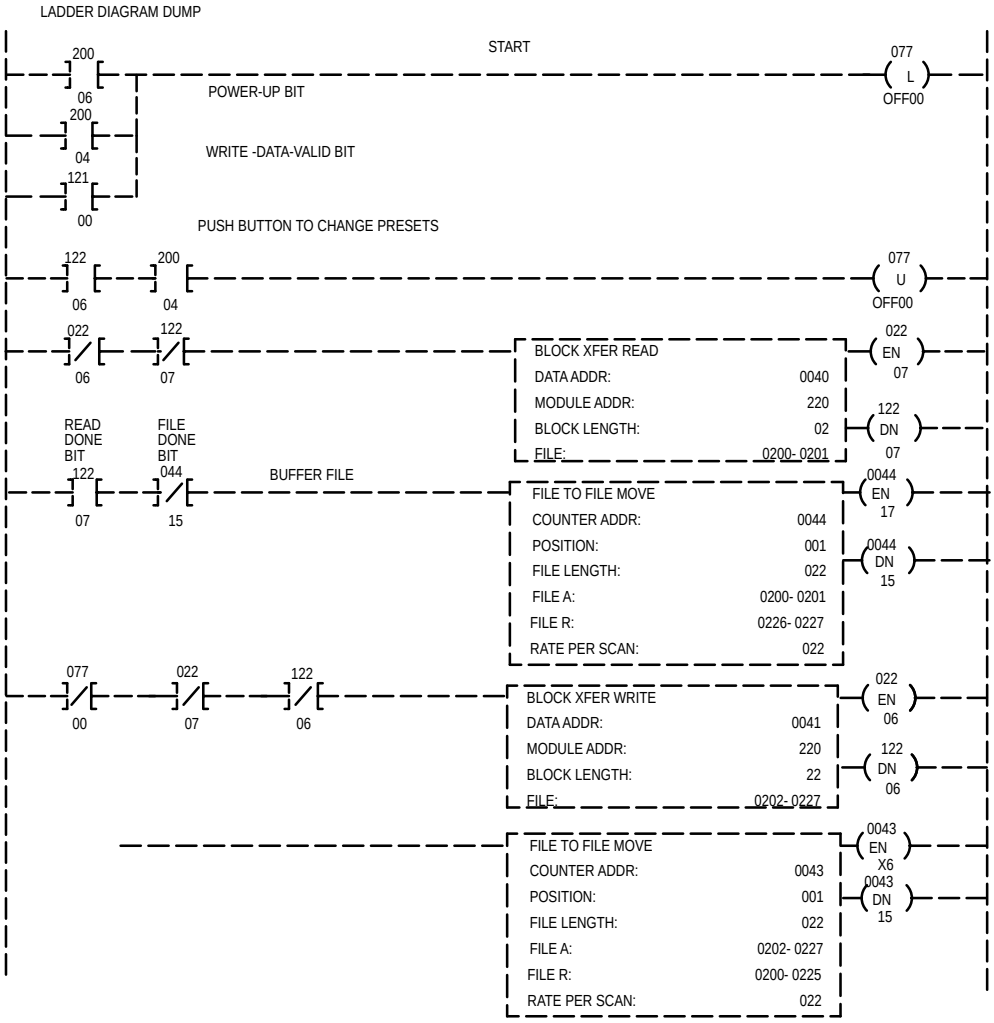
When you have an offset value and the module is controlling eight outputs, for example, the number of words you send to the module is 22. You must enter the numbers 22 and 2 for the block lengths of write and read data. Do not enter the default block length in your instructions if you use the module's offset feature.

For PLC-2 family processors, do not enable the read-and write-block-transfers in the same scan when you use the offset feature. An example program enabling the instruction separate scans follows.

ATTENTION: When the block lengths of bidirectional block-transfer instructions are set to unequal value, do not enable the rung containing the alternate instruction until the done bit of the first transfer is set. If you enable them in the same scan:

- the number of words transferred may not be the number intended
- invalid data could be operated upon in subsequent scans
- output devices could be controlled by invalid data

Unexpected and/or hazardous machine operation could occur. Damage to equipment and/ or injury could result.



Rung 1	200/06 and 200/04 are returned in the read operation and latch 077/00. When 077/00 is latched, the module toggles between a read operation and a write operation. 121/00 is optional and lets the processor initiate a block-transfer-write operation.
Rung 2	This rung examines the write-done-bit (122/06) and the valid BCD data bit (200/04) to unlatch 077/00 and begin the read-only operation
Rung 3	This rung contains the block-transfer-read instruction, conditioned by the read done bit and the write enable bit.
Rung 4	Use a file-to-file move to buffer the read data. Use addresses 0226 and 0227 when making any data comparisons.
Rung 5	This rung contains the block-transfer-write instruction, conditioned by the write done bit and the read enable bit.
Rung 6	This rung is for display purposes only.

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